comorbidities. Indication for AutoSCT included relapsed/refractory follicular lymphoma, diffuse large B cell lymphoma and lymphoplasmacytic lymphoma and upfront consolidation for mantle cell lymphoma. 8 (36.4%) pts underwent AutoSCT as consolidative therapy and 14 (63.6%) pts for relapsed/refractory disease. Therapies prior to AutoSCT were 1-3 regimens. Time to engraftment was 11.7±1.79 days for neutrophils and 15.32±2.6 days for platelets. Be-EAM-related toxicities included nausea, emesis, diarrhea, neutropenic fever and mucositis. 13 (59%) pts had severe mucositis (Grade 3/4) with 5 pts developing neutropenic enterocolitis including 1 patient with pneumatosis intestinalis. Overall, 18 (81.8%) pts were in CR and 2 (9%) pts had minimal disease at D100. 5 (22.7%) pts had relapsed disease. 4 (18.2%) pts died from relapsed or progressive disease.

Conclusion: Bendamustine based conditioning is an effective regimen in patients with NHL undergoing autologous stem cell transplantation as previously reported. It has the potential of causing severe mucositis irrespective of age, comorbidities, disease type or number of prior therapies. This regimen although moderately tolerated should be used cautiously especially in patients who have had prior therapies that can affect the gastrointestinal tract.

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Pegfilgrastim and Planned Plerixafor for Autologous Stem Cell Mobilization Is Safer Than and As Effective As Chemo-Mobilization in Patients with Hematological Malignancies

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Introduction: We have previously shown that as compared with chemo-mobilization (CHM) cytokine mobilization (CTM) is associated with a better chance of achieving a target autologous stem cell dose for patients with multiple myeloma (MM). We now review our experience of autologous stem cell mobilization using a similar strategy for all patients referred for an autologous transplant (auto-SCT).

Table 1
Primary Endpoint Analysis

	Chemo-mobilization (N=19)	Cytokine mobilization (N=55)	p-value
Median total CD34 cells/kg collected (in millions/kg):			
Myeloma	14.9	8.37	**0.01**
Non-myeloma	4.47	5.03	0.71
Median number of apheresis days (mean):			
Myeloma	1 (1.75)	1 (1.76)	0.99
Non-myeloma	2 (1.67)	1 (1.59)	0.89
Target dose achieved:			**0.05**
Yes	16 (84.2%)	51 (92.7%)	
No	3 (15.8%)	4 (7.3%)	
Median day 1 CD34 collection (in millions/kg):			**0.01**
Myeloma	NA	6.86	
Non-myeloma	NA	3.67	

Methods: We analyzed consecutive patients who received an auto-SCT for hematological malignancies at our center from July 2010 to June 2013. CHM was achieved with cyclophosphamide (4 g/m2), pegfilgrastim (12 mg) and plerixafor (0.24 mg/kg once daily until target dose collected or maximum of 4 days apheresis). CTM was achieved with pegfilgrastim and plerixafor. We recorded the total CD34+ cells/kg collection, number of apheresis days, and if the prescribed dose of CD34+ cells/kg was achieved. The prescribed cell dose in patients with MM is 6.0 x 106/kg, and 3.0 x 106/kg for all other hematological malignancies. We compared the median total CD34+ cells/kg dose collection (Wilcoxon test), the mean number of apheresis days (Poission), and target stem cell dose collection (non-inferiority test on two proportions). We also compared day 1 stem cell collection in the CTM group based on disease (myeloma vs. non-myeloma) (Wilcoxon test). Finally, we analyzed the probability of successful stem cell dose collection if the target collection dose was higher than our own criteria.

Results: A total of 74 patients were included. Fifty-three patients had a diagnosis of MM and twenty-one patients had other hematological malignancies, non-Hodgkin (n=15) and Hodgkin lymphoma (n=2). There was no statistically significant difference in age, gender, number of prior induction treatment, prior treatment with lenalidomide and time from diagnosis to transplant between the two groups. In the CHM group, 7 (47%) were hospitalized from complications of mobilization regimen, whereas no patients were hospitalized in the CTM group ($p<0.001$). There was no statistically significant difference in neutrophil or platelet engraftment between CHM and CTM. Multivariate analysis did not reveal predictive factors which lead to >1 apheresis attempts. Table 1 describes the primary outcomes.

Conclusion: Cytokine-mobilization with pegfilgrastim and planned plerixafor is an effective strategy for stem cell mobilization in patients being considered for autologous transplant.

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Pre-Transplant Serum Biomarkers Predict Early Relapse in Classical Hodgkin Lymphoma Patients Undergoing Autologous Stem Cell Transplantation

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Background: Serum biomarkers in classical Hodgkin Lymphoma (cHL) reflect both tumor biology and burden in the non-transplant setting. We sought to determine the prognostic value of cHL serum biomarkers in predicting early relapse following autologous stem cell transplantation (ASCT).

Table
Estimates and Relative Risks (RR) for 2-Year Relapse by Biomarker Strata Among All Patients

Biomarker	Group	All Patients					PR Patients		
		N	2-Year Relapse Estimate (95% CI)	*P*-value	2-Year RR for Relapse (95% CI)	*P*-value	N	2-Year Relapse Estimate (95% CI)	*P*-value
IL-6 (pg/mL)	< 2.15	18	11% (3-38%)				5	0%	
	≥ 2.15	42	57% (42-72%)	**<0.01**	7.11 (1.67-30.27)	**<0.01**	19	59% (38-80%)	**0.04**
IL-10 (pg/mL)	< 1.65	44	30% (19-47%)				17	30% (14-58%)	
	≥ 1.65	16	75% (53-92%)	**<0.01**	4.17 (1.88-9.29)	**<0.01**	7	86% (54-99%)	**<0.01**
sCD30(U/mL)	< 8.65	39	32% (19-49%)				18	33% (17-60%)	
	≥ 8.65	21	63% (43-82%)	**<0.01**	2.88 (1.31-6.32)	**<0.01**	6	100%	**0.01**
sIL-2R (U/mL)	< 1276	52	37% (26-52%)				19	37% (20-63%)	
	≥1276	8	75% (44-96%)	**<0.01**	3.38 (1.34-8.54)	**0.01**	5	80% (42-99%)	**0.03**
CCL17 (pg/mL)	< 343.6	26	16% (6-36%)				8	13% (2-61%)	
	≥343.6	34	63% (47-79%)	**<0.01**	6.10 (2.08-17.93)	**<0.01**	16	63% (47-79%)	**0.04**
Galectin-1 (ng/mL)	< 9.8	13	8% (1-43%)				3	0%	
	≥ 9.8	47	52% (38-67%)	**<0.01**	8.60 (1.16-63.54)	**0.04**	21	53% (34-75%)	0.14
CD68 (pg/mL)	< 3.895	13	8% (1-43%)				5	0%	
	≥3.895	47	51% (38-67%)	**<0.01**	8.53 (1.15-63.08)	**0.04**	19	59% (38-80%)	**0.04**

Methods: Nine serum biomarkers (IL-6, IL-10, IL-13, sCD30, sIL-2R, CCL17, Galectin-1, CD68 and CD163) selected for their prognostic capacities in the upfront setting, were collected pre-ASCT and measured in 61 patients undergoing transplantation at the University of Minnesota or University of Michigan. Using recursive partitioning methods, we calculated cutpoints for each biomarker to optimally separate patients with early relapse (<2 years from ASCT) from those with late relapse/complete remission (CR).
Results: The majority of patients (89%) were in CR (47%) or partial remission (PR) (41%) at the time of transplant. Twenty-six patients experienced early relapse following ASCT, including 9 (31%) in CR and 12 (48%) in PR pre-ASCT. Seven biomarkers identified patients with early relapse from late relapse/CR (Table). By pre-ASCT disease status, no biomarker distinguished early relapse among patients in CR prior to transplantation. Six biomarkers identified early relapse among patients in PR pre-ASCT.
Conclusions: Elevated serum biomarkers in cHL may identify chemosensitive patients in pre-transplant PR at increased risk for relapse. Identification of these high-risk patients may offer opportunities for intervention, such as alternative salvage therapy pre-ASCT or post-ASCT maintenance therapy.

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Comparison of Engraftment Syndrome with G-CSF Versus GM-CSF after Autologous Hematopoietic Progenitor Cell Transplantation for Multiple Myeloma

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Introduction: Engraftment syndrome (ES) is a complication of autologous hematopoietic progenitor cell transplantation (AHPCT) characterized by fever, rash, pulmonary, liver, and/or renal dysfunction. GM-CSF has been previously shown to be associated with a higher risk of ES as compared to G-CSF after AHPCT in heterogeneous patient cohort. We compared the risk of ES with GM-CSF vs. G-CSF after AHPCT exclusively in multiple myeloma (MM) patients who received the same conditioning regimen.
Methods: We analyzed consecutive patients who received melphalan 200 mg/m^2 followed by an AHPCT for MM from 2008 to 2014. ES was diagnosed using a minor modification of the Maiolino criteria (MC) and Spitzer criteria (SC). ES using MC was defined as a noninfectious fever 〉 38°C plus rash or pulmonary infiltrates within 96 hours of neutrophil recovery. ES using SC was defined as the presence of 3 major or 2 major plus 1 or more minor criteria within 96 hours of neutrophil recovery (major criteria: noninfectious fever 〉 38°C, rash, pulmonary infiltrates; minor criteria: liver/kidney dysfunction, weight gain or encephalopathy). We analyzed the incidence of ES using exact logistic regression, and time to engraftment and hospital length of stay (LOS) using Kaplan-Meier, logrank test and Cox proportional hazards regression.
Results: A total of 111 patients were included (68 received G-CSF and 43 received GM-CSF starting day +3 of AHPCT). There was no significant difference in patient age, gender and race. Peripheral blood stem cell mobilization was achieved using a plerixafor-containing regimen in 45% of patients in the G-CSF group vs. 95% of patients in the GM-CSF group (p=0.001). A cyclophosphamide-containing regimen was used for mobilization in 45% of patients in the G-CSF group vs. 9% of patients in the GM-CSF group (p=0.001). The incidence of ES by MC and SC were 24% and 13%, respectively. In unadjusted analysis, the GM-CSF group was significantly more likely to develop ES than the G-CSF group using SC (28% vs. 3%; odds ratio, OR=12.5; p=0.001) and MC (47% vs. 10%; OR=7.42; p=0.001). After adjusting for age, gender, race and CD34+ cell dose, the GM-CSF group remained at higher risk for ES than the G-CSF group (OR=10.4, p=0.069 for SC; OR=5.91, p=0.029 for MC). The GM-CSF group also had a significantly longer time to neutrophil engraftment than the G-CSF group by 1 day (p=0.001); the difference remained after multivariable analysis (hazard ratio, HR=0.22; 95% CI: 0.12 to 0.43; p=0.001). There was no significant difference between the two groups with respect to time to platelet engraftment (p=0.891). The median LOS of the G-CSF and GM-CSF group was 15 and 16 days, respectively, although not statistically significant (p=0.279).